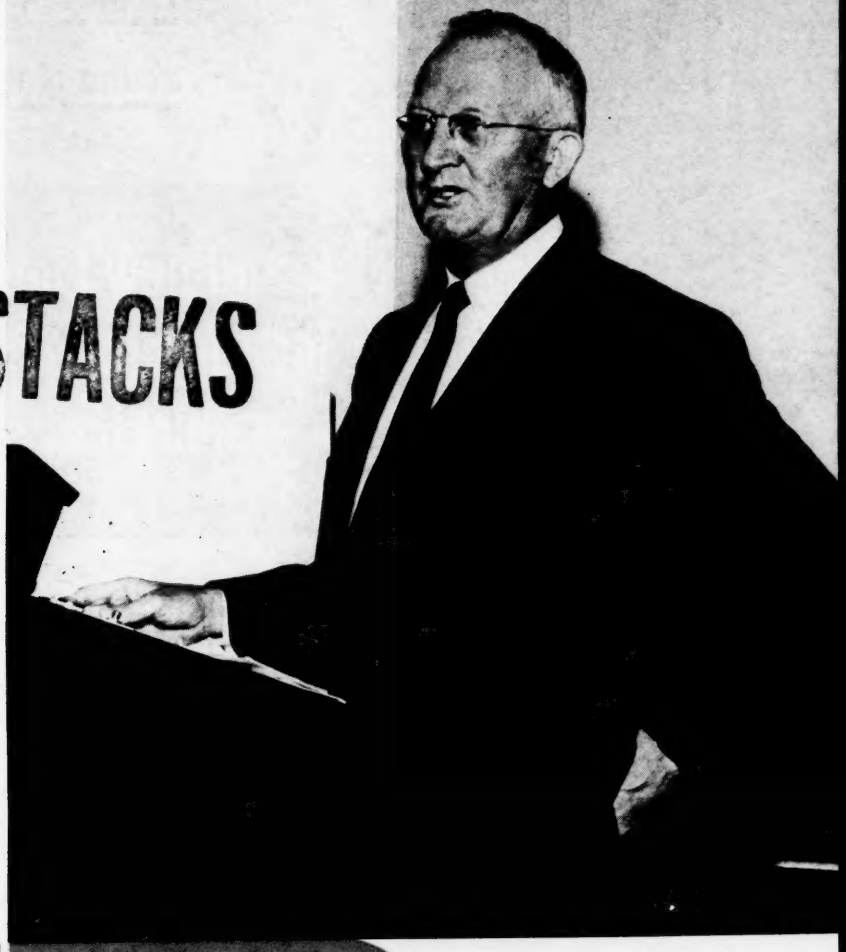

William A. Pennington, 1960-61 President ASM (see article, p. 5)

STACKS

October, 1961

MR

METALS REVIEW

The News Digest Magazine

To be featured in Booth 706

at the Metal Show

Brand-new Lindberg equipment for the production of metallurgical atmospheres

The new Lindberg HYAM AMMONIA DISSOCIATOR, Model 200, offers a combination of efficiency, capacity and compactness never before available. *The unit requires less than 2 square feet of floor space.* Operating at capacities up to 200 c.f.h., it is *guaranteed* to maintain or exceed 99.95% dissociation efficiency (at 150 c.f.h. 99.99% efficiency) It is particularly designed for pilot plant applications, research and development, where purity of atmosphere is required.

The new Lindberg HYEN ENDOTHERMIC GENERATOR is a fully automatic process for producing low cost protective atmospheres for bright hardening, bright annealing or bright brazing of steel totally free from decarburization or carburization. This unit is *air-cooled* eliminating the expense and trouble of water cooling systems. The HYEN Generator is available in 200, 500, 750, 1000 and 1500 c.f.h. capacities and larger sizes can be provided if desired.

Because of the importance of metallurgical atmospheres in metal working we are giving the subject major emphasis in our exhibit at the Metal Show. Visit us there and you'll be able to learn about all the latest developments in methods and equipment for producing and controlling these atmospheres. You'll find us well qualified to offer authoritative advice in this field because we've pioneered in it.

In equipment, the first endothermic atmosphere generator was developed by Lindberg many years ago. Through the years, generators for varied types of metal treating atmospheres have been developed including units for exothermic, dissociated ammonia and inert atmospheres, and design improvements continually added.

Years ago, too, Lindberg designed the first equipment for controlling metallurgical atmospheres, the Lindberg Carbotrol. For this, Lindberg research also created dew point equilibrium curves to establish proper atmosphere values for types of steel and temperatures involved. The Carbotrol automatically controls these values. It is also available incorporating the new CO_2 infra-red system of control.

If you don't get to see us at the Show you can get full information on all Lindberg equipment from your local Lindberg Field Engineer (see your classified phone book) or write us direct. **Gas Process** Division, Lindberg Engineering Company, 2450 West Hubbard Street, Chicago 12, Illinois.

Los Angeles plant: 11937 S. Regentview Avenue, Downey, California. In Canada: Birlefco-Lindberg Ltd., 15 Pelham Ave., Toronto 9, Ont. Also, Lindberg plants in Argentina, Australia, England, France, Italy, Japan, Spain, Switzerland and West Germany.

LINDBERG

heat for industry

October, 1961 Vol. XXXIV, No. 10

METALS REVIEW

The News Digest Magazine

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Published monthly at 404 N. Wesley Ave., Mount Morris, Ill., by the American Society for Metals. Editorial and general offices Metals Park, Novelty, Ohio: W. A. Pennington, President; C. E. Swartz, Vice-president; R. J. Raudebaugh, Treasurer; Merrill A. Scheil, Secretary; C. H. Samans, A. R. Fairchild, Morris Cohen and John Convey, Trustees; Walter Crafts, Past President; Allan Ray Putnam, Managing Director. Subscriptions, $3.00 per year ($7.50 foreign). Single copies $1.50. Second class postage paid at Mount Morris, Ill. and at additional mailing offices.
Claims for missing numbers will not be allowed if received more than 60 days from date of issue. No claims allowed from subscribers from overseas, or because of failure to notify the circulation department of a change of address or because copy is "missing from files".

The Editors' Page

Some of the colorful names of metals will soon go into discard if the Copper and Brass Research Association is successful in a campaign it has just launched. Henceforth, says CABRA, all copper and copper-base alloys will be identified by a copper alloy number. No longer will we refer to brass, bronze, nickel silver, Muntz metal and the long list of other names of alloys in this group. Two examples of the changes coming are: Oxygen Free Certified (OFC) Copper is to be known as Copper No. 101 and Phosphor Bronze E becomes Copper Alloy No. 502. Furthermore, mills producing these materials, historically known as brass mills, will be referred to as copper mills.

There appears to be much logic in CABRA's move, but we'll miss the old familiar names. And just think of the effect the move will have on our language. We just can't imagine anyone saying "He's got more nerve than a Copper Alloy No. 268 (brass) monkey".

Noteworthy Advances

Along with reporting the important news, we consider it our duty to publish other items which though trivial are interesting. Following up a recent item on the use of permanent magnets in the stomachs of cattle, comes the news that cow teeth are now being capped with stainless steel in the event the original choppers are too worn down to provide proper service. Now, if you are touring in the country and are greeted by a broadly smiling cow perhaps she is only showing off her new dentures.

In what might be termed a counteroffensive move, stainless steel is now about to replace aluminum in a field long dominated by the light metal. We refer to metal beer barrels. One fabricator has been able to produce a strong, durable stainless steel barrel which weighs only 27½ lb. It is estimated to have a 25-year service life. In addition, the barrel requires no pitch or protective coating and, thus, no maintenance other than cleaning.

On the serious side, items such as these help to prove the point that there is scarcely any field of activity which cannot benefit from imaginative metals engineering.

Exodus

At about the time you readers see this page, a major portion of ASM's staff will be moving into Detroit's Cobo Hall to carry on the final preparations for this year's Metal Show and Congress. Everyone is enthusiastic about the events planned for Detroit, starting with the hall itself and ranging onward to the Thursday night dinner-dance which will present a complete and excitingly new format with many ingredients including a period of dancing following the formalities and entertainment. We advise an early purchase of tickets for you, your wife and your friends.

Space Phenomena

Some of the possible effects of space travel on materials are now being studied. Among other things, it has been learned that in a super vacuum certain metals pit in a strange manner akin to evaporation. Thus, entire sections of a space vehicle might disappear during an extended voyage. Other strange behaviors include: greases and lubricants vaporizing; metals cold welding after contact of a few days in the absence of air; certain plastics losing strength and others growing stronger; microorganisms becoming lifeless after periods of 20 to 30 days in high vacuum cadmium, zinc and some magnesium alloys. Among the best materials are iron and steel, titanium, tungsten and platinum. Should evaporation occur it could destroy electronic circuits due to the fact that evaporated metal would condense on nearby objects. We are indebted to Hughes Aircraft Co. for these bits of knowledge.

Case Materials Growth

Metallurgy and materials science are certainly coming in for their share of attention in the Cleveland area. Much of the spotlight is shining on the activities of Case Institute of Technology. The gleaming new Charles M. White Metallurgy Building of Case was dedicated on Tuesday, Oct. 10. The $2.7 million metallurgy facility is named after Mr. White, the former president and board chairman of Republic Steel Corp. The new building will connect with another projected new structure to be known as the Olin Laboratory for Materials. Incidentally, Mr. White was made an honorary life member of ASM in 1956.

Scholarship Meeting

A special meeting by the Metallurgy-Ceramics Foundation will be a feature of this year's National Metal Congress. The Seminar will be titled "Scholarships and Future Manpower". Its purpose is to explore present scholarships available in metallurgy and ceramics and attempt to determine what motivation is necessary to interest more students to select these fields. In addition, it is the desire of those developing the program to acquaint schools with the over-all program of Metallurgy-Ceramics Foundation and to acquaint industry with the scholarship situation.

Two former presidents of ASM are active in arranging the program —George Roberts and Adolph Schaefer. Walter Crafts, also a past president, and now completing a term as president of the ASM Foundation for Education and Research, is also prominent in this activity.

The meeting is scheduled for 2:30 p.m., Monday, Oct. 23.

T. C. DuMond

ASM Members—Admission to the National Metal Congress and Exposition is by your ASM Membership Card or $2.00. Don't forget your membership card!

Metals Review Salutes: *Bill Pennington*

Presiding Officer at the Detroit National Metal Show

An ASM president's final official duty, and perhaps the most demanding one of his entire tenure, is to preside over the Society's National Metal Congress and Exposition. The size and scope of the technical sessions and displays make this one of the biggest presidential jobs in any engineering society.

William A. Pennington, ASM president for 1960-1961, is eminently equipped to do the job, and do it well. His friendly enthusiasm and keen sense of humor will stand him in good stead to tackle the many speaking appearances, interviews, meetings and other tasks confronting him in Detroit.

His "baptism in fire" will begin Monday evening, Oct. 23, with the ASM Awards Dinner. Eight important awards will be presented to leaders in the metal industry. Two other awards events will follow: the Annual Banquet and the Distinguished Service Luncheon.

This latter occasion will perhaps be the most pleasant for Bill, as he talks to hundreds of young engineering students from area colleges and universities. Long an outspoken advocate of engineering education on an accelerated scale, he comes into daily contact with students through his work as head of the Department of Metallurgy, University of Maryland, College Park. Each year at the Distinguished Service Luncheon, ASM plays host to such students along with the growing roster of 25-year ASM'ers. This gives the youngsters a splendid opportunity to "talk shop" with men who have gained long experience and knowledge in the field.

Wednesday, Oct. 25, he will conduct the Annual Meeting at Cobo Hall. He and the others in the 1960-61 slate of officers and trustees will have much to report and much of which to be proud. Among the year's many accomplishments are:

1. Publication of the New Metals Handbook, 8th Edition, Vol. 1, "Properties and Selection of Metals". Under Dr. Pennington, the ASM Trustees also approved a plan to complete the 8th Edition with four more volumes.

2. Establishment of Two New Quarterlies. The *Transactions Quarterly* provides a medium for publishing Metal Congress research and scientific papers before their presentation and is a great step forward in speeding technical communications. The *ASM Metals Engineering Quarterly* provides for the first time a magazine for publication of the important engineering papers presented at Metal Congresses, plus chapter-sponsored conferences.

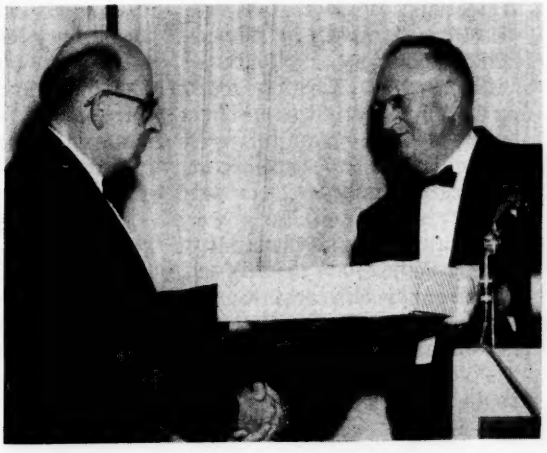
3. ASM's 34,000th Member, 117th Chapter. In July 1960, ASM's 34,000th member was signed up. And with the formation of three chapters in the Carolinas where one had been before, there are now 117 chapters of the Society, plus 20 student groups.

4. New Regional Conference Plan. Under a dramatic new plan approved by Dr. Pennington and the ASM Board of Trustees, the Society will bring regionally oriented conferences and exhibitions to cities not having National ASM shows. First of these is the Conference and Exhibition which will take place in Houston, Tex., Apr. 17-19, 1962. This event, like the others to come, is based on the needs of the particular region.

In addition to these 1960-1961 developments, Dr. Pennington will reflect on the scores of chapter visits he has made during his year as president. He will remember the fine Western Metal Show in Los Angles, the 1960 Philadelphia Metal Show, the important first step in rededicating the ASM Show to the metals industry it serves, and the place where he was inaugurated 41st president of ASM.

As he looks to the Detroit Metal Show and the duties awaiting him there, Bill Pennington has the support and best wishes of ASM's 34,000 members. His job doesn't end in Detroit, however. Far from it. After the Metal Show, he will serve a one-year term as Society trustee, in which his guidance and counsel will be most valuable to the new slate of officers. In addition, he will serve as president of the ASM Foundation for Education and Research.

Metals Review is proud to salute Dr. William A. Pennington, engineer, educator and outstanding president of the American Society for Metals.



Retiring President Walter Crafts receives President's Tray from incoming President Pennington at 1960 Metal Show

Materials Science at Stanford University

By Oleg D. Sherby

In the past two or three years, departments of metallurgy and metallurgical engineering in several universities in the United States have changed their names to "Department of Materials Science". Metallurgy students at Stanford were greeted with such a change when they returned to the University after summer vacation in 1960. What has prompted such changes in the departments of metallurgy in our country?

The answer can be uncovered when one observes the history of metallurgy. Metallurgists have always been interested in the physical, mechanical and corrosion properties of nonmetallics. Before World War II almost all physical metallurgical students were given courses in extractive metallurgy where they learned a lot about various types of firebrick and sand, as well as fluidity and other properties of slags as a function of composition, and so on. After the war, new courses in advanced physical metallurgy were introduced which began to crowd out the extractive courses from the physical metallurgy curriculum.

In turn, interest in physical ceramics courses was on the upswing. It was natural to locate new ceramics activities near the already existing metallurgy department, and it soon became evident that many of the modern tools of physical metallurgy were readily applicable to the study of ceramic bodies.

With physical ceramics and metallurgy working so closely together—and indeed, many metallurgically trained researchers are doing work on ceramic materials—it was only natural to think of combining the two fields into one and to rename the conglomerate "Materials Science". It is my opinion, however, that the idea of such an integration did not originate from university faculty but rather was pointed out to them by industry. Companies throughout the metal consuming industry have materials engineering groups whose major function was to make use of the best available materials or develop substitute materials for specific applications. Such groups usually consist of engineers and scientists with varied backgrounds.

This mixture of differently trained personnel has lead to the accelerated development of many new products, especially in the field of composite materials. As an example, sintered aluminum powder is a composite material consisting of a metal (aluminum) and a ceramic (aluminum oxide) which shows promise as a strong, heat resistant light alloy.

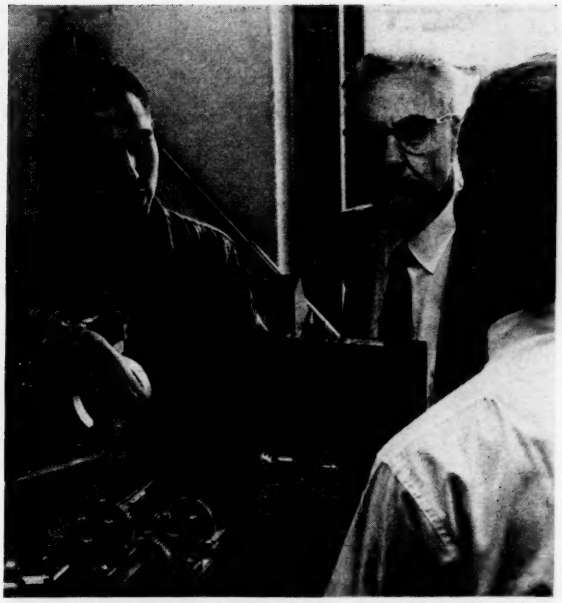
On the other hand, glass reinforced plastics are composite materials consisting of glass fibers (ceramic) embedded in various types of resins (high polymers). Such materials have found extensive use as structural components, the ductility and rigidity of the glass fibers being improved by the presence of the high-polymeric matrix.

It is the intention of the Department of Materials Science at Stanford to emphasize teaching and research in physical metallurgy and physical ceramics. Electronic and mechanical behavior of nonmetallics and composite materials will be of special interest to the department because of extensive industrial activity in semiconductors, electronic components and aerospace materials in the local area.

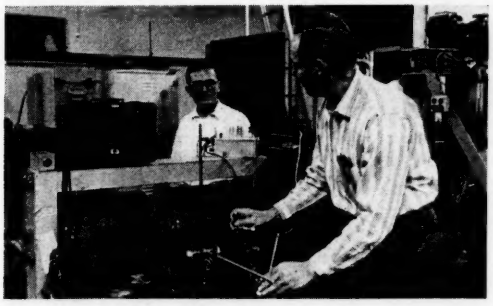
Dr. Oleg D. Sherby received his undergraduate and graduate training from the University of California at Berkeley. He worked for a number of years as a research metallurgist in the Institute of Engineering Research, University of California, doing research on mechanical behavior of solids. He was a National Science Foundation post-doctoral fellow at Sheffield University, England, for a year and also spent a year as scientific liaison officer in metallurgy with the U. S. Office of Naval Research in London. Dr. Sherby joined the faculty at Stanford University in 1958, and is currently associate professor of materials science. He is author or co-author of over 30 publications on mechanical behavior and diffusion studies in materials. He is chairman of the Santa Clara Valley Chapter ASM.

At Stanford, teaching and research in polymer materials will be closely related to activities of the Materials Science Department and will be carried out in the same building. Top staff members, however, will be members of the Chemistry and Chemical Engineering departments. This situation is in part due to the fact that a typical polymer scientist will usually prefer to be associated with a chemistry or chemical engineering group rather than with a metallurgy or metal physics group. The attitude is understandable because, for the most part, the language of the high-polymer scientist is quite different from that of a typical metallurgist or solid-

Sam Bradt, left, graduate student, and Duane Johnson, right, National Science Foundation summer teacher fellow, take readings during high-temperature compression creep testing of a germanium polycrystal



Jack Robbins, left, graduate student, describes intricacies of making torsional measurements on iron-base alloys at elevated temperatures to Prof. O. Cutler Shepard, head of the Dept. of Materials Science, and to Prof. Sherby



Lowell Klaisner, left, graduate student, and Edward Reid, National Science Foundation summer teacher fellow, prepare to make nuclear magnetic resonance measurements in metals. Such measurements can yield information on atomic mobility in crystalline solids. The work is under the supervision of Prof. H. Huggins

state physicist.

We envision that high-polymer activities in materials science departments will come in by the back door. For instance, a physicist or metallurgist working on some specific property with metals and ceramics may wish to see how crystalline, high-polymeric materials fit into the scheme of things as he has developed it for inorganic substances. In this way he may become interested in high polymers and eventually may develop competence and a sustained interest in this field.

There is little doubt that many high polymers behave like metals and alloys. For example, the structure of some thermoplastic polymeric materials can be controlled by appropriate heat treatment in a manner similar to precipitation hardening alloys. (As in alloys, these property changes are reversible.) Many polymers exhibit order-disorder type phenomena, as well as time-dependent diffusion involving motion of vacancies. It is our conviction that Materials Science departments should have good courses in the science of high polymers.

What will be some of the future activities of a typical Department of Materials Science? I envision a unified teaching effort embracing physical, electrical, mechanical and other properties of all types of materials. Emphasis will be placed on the relation of structure—electronic, atomic, molecular, crystal—and the corresponding properties of materials. Eventually, Materials Science departments will be involved in scientific research efforts dealing with all types of materials, including even such currently unsophisticated products as concrete, leather and tar.

A Materials Department will bring together a faculty with highly diversified scientific backgrounds including metallurgy, ceramics, physics, organic and inorganic chemistry, physical chemistry and mathematics, as well as some of the engineering professions such as electrical and civil engineering and engineering mechanics.

The science of materials as a whole appears to be in the same stage of development as physical metallurgy was in the 1940's. Much has been learned and developed already, but many discoveries and laws will be uncovered in the exciting years ahead.

All Roads Lead to Detroit to The National Metal Show

Special Section 1961 Metal Show

BUILDING ATTENDANCE FOR THE SHOW *is largely a matter of letting the right people know, says W. P. Lewis, right, chairman of the attendance committee for the National Metal Congress and Exposition. Assisting him are Robert Sergeson, vice-chairman, and Maurice L. (Bud) Smith, advertising and sales promotion director for the Metallurgical Products Dept., General Electric Co.*

Young Engineers Day

"Young Engineers Day", a traditional feature of the National Metal Show, will be observed once again this year on Friday, Oct. 27. Hundreds of engineering students from Detroit area colleges and universities have been invited to attend the Metal Show as guests of the ASM. Exhibitors plan to give part of their time that day to explaining latest developments to these future engineers.

The invited students then will join with the growing roster of ASM's 25-year members in the annual Distinguished Service Luncheon, at Cobo Hall, as guests of the Society. This event provides the students with an excellent opportunity to discuss their careers with men who have gained long experience and knowledge in the metalworking field.

As an added incentive to the students to continue their studies in the demanding field of metallurgical and materials engineering, ASM will present its $2000 Bradley Stoughton Award for outstanding young teachers. Winner must be under the age of 35 and have already demonstrated unusual ability to inspire students and impart knowledge and understanding. The Award will be presented to George R. St. Pierre, associate professor of metallurgical engineering at Ohio State University.

Show Manager to Brussels

In line with ASM's continuing efforts to inject new and better ideas into its National Metal Shows, William J. Hilty, exposition manager, has just returned from a visit to the Seventh European Machine Tool Exhibition in Brussels, Belgium. During his four-day visit he talked with many exhibitors and with the exhibition management, learning some of the show techniques employed abroad.

Metal Show Host Committee

Top executives from a cross section of Detroit industry are serving as honorary sponsors of the Detroit National Metal Show. Through the Detroit Host Committee, five industry leaders will be welcoming an anticipated 30,000 visitors from the United States, Canada and many parts of the world.

In announcing the Host Committee, ASM Managing Director Allan Ray Putnam said "these five outstanding Detroiters are repesenting industry in the nation's second largest metalworking city. In presenting the National Metal Show in Detroit for the first time in ten years, ASM enthusiastically acknowledges the cooperation and good wishes of this Host Commit-

ASM CHAPTERS COOPERATE *on Detroit Metal Show—Robert B. Boswell, center, chairman of the reception center hospitality committee, is making certain that queries about ASM from visitors to the Show will get the right answers. With Boswell in a recent committee meeting are Robert Havens, Toledo chairman, Henry G. Shepherd, Western Ontario chairman, Thomas Clark, Jackson vice-chairman, and Arthur Tinnetti, Saginaw Valley vice-chairman*

tee". Members are:

Harold G. Warner, vice-president of General Motors Corp. and general manager of the Cadillac Motor Car Division; Leroy B. Bornhauser, group executive-power train manufacturing, Chrysler Corp.; H. G. Bixby, president and general manager, Ex-Cell-O Corp.; Peter H. Ponta, director, manufacturing staff, Ford Motor Co.; Ivor Bryn, executive vice-president, McLouth Steel Corp.

In addition to their honorary positions as hosts for the Metal Show, the five will be distinguished guests at the ASM Annual Banquet, Thursday, Oct. 26.

"New Look" at Annual Banquet

National Metal Show visitors are invited to attend the festive "new look" Metal Show Dinner-Dance, Thursday evening, Oct. 26, at the Detroit Statler-Hilton. Never before have so many entertainment features been packed into a Metal Show special event.

Evening's festivities get underway with an open reception and cocktail hour, followed by the splendid Statler-Hilton cuisine. The evening closes with two hours of dancing to the music of Fred Crissey and the "Metalarks".

Low price of $12.50 includes dinner and entertainment plus a four-star address by General Bernard A. Schriever, America's missile "boss". No one who is interested in materials as they relate to the aerospace future of our nation should miss this important address.

Also, on the serious side of the program, will be presentation of the major awards of the Society. The annual banquet should be a "must" on every Metal Show visitor's program.

Any Questions About Steel?

Metal Show visitors with questions about modern steel or steel products won't have to look far for factual answers, according to U. S. Steel Corp. Expert information about properties, fabricating techniques and end uses for today's "family" of 10,000 steels can be had for the asking at a unique Technical Center to be featured in U. S. Steel's exhibit area at the National Metal Exposition in Detroit's Cobo Hall.

Technical experts from U. S. Steel's nation-wide metallurgical and service staff have been scheduled for the Center during Show week to answer visitor's queries and discuss steel applications. Home offices, names and titles of staff members who will be assigned to the Technical Center are:

PITTSBURGH: R. D. Webb, manager, structural, plate and high-strength steel metallurgy; J. B. R. Anderson, staff metallurgical engineer, carbon bar and semifinished steel products; H. K. Yeager, assistant manager, alloy steels metallurgy; P. R. Wray, assistant chief metallurgical engineer; J. R. England, staff metallurgical engineer, alloy steels; W. J. Baumgarten, metallurgical engineer, ordnance steels; R. B. Wallace, metallurgical engineer, bearing steels; H. A. Moorhead, manager, carbon bar and semifinished steel metallurgy; W. A. Dennis, central area manager, technical services; A. W. MacLaren, manager, customer technical services; G. F. McHale, assistant manager, structural, plate and high-strength steel metallurgy; L. W. Oswald, assistant manager, carbon bar and high-strength steel metallurgy; D. S. Llewelyn, metallurgical

THOROUGH BRIEFINGS WELL IN ADVANCE *are necessary to assure smooth running of the 1961 Metal Congress and Exposition. Floor plans and meeting room arrangements are studied by the arrangements committee by, from left: Richard Trax, Ternstedt Division, General Motors Corp., Robert H. Shoemaker, Kolene Corp., chairman of the arrangements committee, Henry G. Shepherd, Border Tool & Die, Ltd., vice-chairman, and Newell Fox, a Cobo Hall service representative*

EDUCATION IS THE BYWORD *at the Detroit Metal Show and the science and vocational teachers committee is working to coordinate the program for maximum educational impact. Shown are, from left: Elmer McDaid, head of the science teaching department, Detroit Public Schools, A. L. Weid, principal of Detroit Lutheran Schools, Donald J. Henry, ASM Convention chairman, and George Bidigare, committee chairman*

DINNER-DANCE BOOSTERS—*Howard N. Bosworth, right, president of the steel treating company bearing his name, is "selling entertainment" for the 1961 Metal Show. As chairman of the Dinner-Dance Booster Committee, he is responsible for spreading the word on the program of special events in store for Metal Show visitors. Shown are Jay Lurye, representative of the agency providing the entertainment, Donald J. Henry, convention committee chairman, T. C. Du Mond, ASM Metal Congress manager, and Mr. Bosworth*

engineer; and D. W. Kinsey, metallurgical engineer.

CINCINNATI: C. F. Carpenter, metallurgical engineer.

CHICAGO: E. P. Epler, assistant area manager, technical services; and K. F. Syren, metallurgical engineer.

CLEVELAND: E. R. Driscoll, metallurgical engineer.

INDIANAPOLIS: O. F. Hager, metallurgical engineer.

DETROIT: C. T. Mueller, area manager, technical services; and P. J. Shiels, A. C. Gagstetter, J. R. Owen, D. J. Hayes, M. E. Stewart and C. H. Stokes, metallurgical engineers.

Adjoining the Technical Center, a group of product specialists will staff a display featuring many of the products and services available to industry from U. S. Steel and its National Tube, American Steel and Wire, and U. S. Steel Supply Divisions. Interesting facts about these products and services will be explained to Show visitors by an intriguing "phonomimic" technique.

Requests for product and technical literature will immediately be teletyped from the exhibit to U. S. Steel's direct mail center in Pittsburgh, so that the literature requested should be waiting for the Show visitors when they return home.

Ductile and Brittle Fracture

Higher strength and reliability requirements have intensified the research on the problem of fracture. Current evidence is that both ductile and brittle fractures of metals nucleate at the atomic level, according to George M. Sinclair, College of Engineering, University of Illinois, speaking before the **Tri-City** Chapter.

Research indicates that engineering variables of importance in fracture of metals include chemical composition, microstructure, state and magnitude of stress, temperature, strain rate and physical geometry of the actual piece under investigation.

All metals show an increase in yield strength with decreasing temperature. The amount of change in yield strength varies with the metal being tested. In some metals the change is very gradual and has a relatively insignificant influence on fracture behavior. Other metals, mild steel as an example, show a very large change in yield in temperature, leading to an abrupt ductile-brittle transition in fracture behavior.

Microcrack lengths necessary for fracture are inversely proportional to the square root of the crack length. Detection of cracks in materials is being studied in an attempt to reduce the catastrophic failure of high strength, low weight aircraft and missile components. *(Reported by D. N. Wiele)*

YORK PAST CHAIRMEN ASSEMBLED *at a Chapter meeting which also honored sustaining members from the York area. Twelve past chairmen were present including, from left: Roy E. Livingston, 1955; A. J. Kleiner, 1946; C. A. Sloat, 1951, R. W. Musser, 1954, Glenn Frank, 1949, G. E. Shubrooks, 1944, D. E. Flinchbaugh, 1943, A. R. Kunkle, 1947, A. Floyd Whalen, 1937, William F. Allen, 1933, Paul D. Strubhar, 1959, and John H. Fisher, 1956. Carl Zapffe spoke on "Science, Religion and World Events"*

New Mill to Produce Refractory-Metal Sheet

Speak of the so-called exotic metals and one immediately thinks of tungsten, tantalum, columbium and molybdenum. But these materials are playing an increasingly important role in our lives and their promise for the future is a sure indication that they may soon enter a period of common use outside the defense and aerospace industries.

A sign of the trend is the $15-million building program being completed in Euclid, Ohio, by General Electric. The company is spending that much on new mills and other equipment capable of making refractory metal sheet up to 24 in. wide and in thicknesses of 0.005 to 0.500 in G.E., which has been producing tungsten wire since it began making lamps, along with rod for contacts and tungsten and molybdenum sheet for electronic applications, expects to roll the first wide tungsten sheet and plate in time to exhibit it at the Metal Show in Detroit this month.

Why is the company investing such a large amount on refractory metals? According to Robert F. Johnson (photo), manager of the Lamp Metals and Components Dept., G.E. itself will be a large user because of its stake in the defense and aerospace industry. But Mr. Johnson also sees these applications for refractory metals—jet engines, propulsion systems, missile skins, nuclear reactors—as forerunners of civilian markets. One has only to consider the laws of thermodynamics which tell us that in converting heat to other forms of energy, the highest possible operating temperatures give the highest operating efficiency. Thus, any device that can be improved by raising its temperature—engines, steam turbines, reactors—has potential applications for refractory metals.

The primary goals of the new rolling mill are to scale up G.E.'s refractory-metal production facilities and, more important, to provide refractory-metal sheet and plate, beginning with tungsten and molybdenum, that is uniform in metallurgical properties and dimensional tolerances from lot to lot, day to day.

This won't be easily accomplished because of the high working temperatures that will be encountered. Tungsten, for example, must be worked at 2800 to 2900°F. The sheet will be rolled, starting with sintered slabs or flat extrusions, taking care to insure that temperature, percent reduction and other factors which affect the final properties are carefully controlled. Very precise relationships exist between these factors and the properties of the types of sheet made for various applications. This means that close control of in-process annealing and other process variables is necessary.

Robert F. Johnson . . . "Military and aerospace uses for refractory metals are forerunners of commercial applications".

Dr. Howard T. Green, manager of refractory metals engineering at G.E., states that all these factors have been given careful consideration in designing the new plant. He points out that precise production scheduling and control which permit the sheet to be rolled at progressively lower temperatures and by the correct amount of reduction in thickness has the effect of reducing the ductile-brittle transition temperature. Equally as important, it will assure that the sheet that is rolled today will have the same properties as sheet rolled six months from now.

Chapter Meetings for November

Nov. 3

Lehigh Valley—Hotel Traylor. Morris Cohen . . . Brittle Fracture of Mild Steel

Ontario—Fischer Hotel. J. W. Ross . . . Joining Metals in the Immediate Future

Nov. 6

Cleveland—CES Bldg. Panel: Aluminum Vs. Iron in the Automotive Engine.

Nov. 7

Oregon—Annual Stag Party

Nov. 8

Dayton—J. F. Wallace . . . Control of Solidification Phenomena

Utah—Kennecott Copper Corp.—Tour of the Utah Refinery

Nov. 13

Chicago—Old Spinning Wheel. Carl Swartz . . . Continuous Castings

Chicago-Western—Old Spinning Wheel. Carl Swartz . . . Continuous Castings

Nov. 14

Milwaukee—Astor Hotel. Carl Swartz . . . ASM and the Uncommon Man

Muncie—John A. Fellows . . . Abrasion Testing and the Properties of Abrasion Resistant Materials

Saginaw Valley—High-Life Inn. J. E. Rehders . . . Nodular Iron

Syracuse—Yates Hotel. F. Kenneth Bloom . . . Stress Corrosion

Tri-City—Blackhawk Hotel. Robert S. Day . . . Temperature Measurement and Control

Nov. 15

Delaware Valley—Robert F. Davis . . . Idea to Patents

Long Island—Carl Hoppls Restaurant. Mars Hablanian . . . Electron Beam—A Versatile Metallurgical Tool

Nov. 16

Carolinas Northern Piedmont—Banners Restaurant. . . . Ladies Night

Nov. 17

Philadelphia—Engineers Club. Carl Swartz . . . Continuous Castings

Nov. 20

Baltimore—R. K. Wuerfel . . . Induction Heat and 300,000 Psi. Axles

Indianapolis—Athenaeum Turners Club. Carl Swartz . . . Continuous Castings

Nov. 30

Boston—MIT Faculty Club. Vincent Lysaght . . . Hardness Testing; N. Wayne . . . X-Ray Inspection; F. B. Stern . . . Zyglo-Magnaflux Inspection

MEN in METALS

• William D. Manly has been appointed director of the Gas-Cooled Reactor Program at Oak Ridge National Laboratory. In his new position, Manly is responsible for ORNL's contributions to EGCR, a $40-million experimental helium-cooled power reactor. These contributions include the design, development and procurement of fuel elements and control rods. The Laboratory is also serving as technical advisor to the AEC in reviewing the detailed design of the experimental reactor.

The fuel elements for EGCR consist of uranium oxide fuel pellets (enriched) encased in stainless steel tubes. Seven of these are nested in places inside a heavy-walled graphite tube.

In addition to the EGCR project, studies of pebble bed reactors and experiments on utilization of beryllium as a cladding material for gas-cooled reactors are also under Manly's direction. In a pebble-bed reactor, compounds of uranium are mixed with graphite (by powder-metallurgy techniques or other means) and are then formed into spheres. A random arrangement of uniform spheres contains about 40% voids for passage of coolant gas. The temperature can go to 1800° F. at the surface without any tendency for the pebbles to fuse together.

William D. Manly

Associated with ORNL since 1949, William Manly's initial responsibilities were with the Aircraft Nuclear Propulsion Project. Later his group was given direct responsibility for all materials effort in support of the various reactor projects at Oak Ridge. Accomplishments of his group included development of an alloy, INOR-8, which makes possible higher-temperature operation of fused fluorides, and devising original nondestructive testing techniques and methods for welding and brazing beryllium.

Manly is a member and is active in many professional technical societies including ASM. He has been a member of ASM's Development Committee since 1959 and is currently its chairman. He was a member of ASM's Handbook Committee and National Publications Committee from 1954 to 1956. He has lectured before many local ASM chapters and was chairman of the Oak Ridge Chapter in 1953-54.

• William H. McCormick, formerly assistant director of metallurgy, customer technical services, has been appointed company metallurgical engineer for Crucible Steel Co. of America. William R. Mogg, formerly assistant director of product development, has been named assistant director of metallurgy, technical services.

• W. K. Morga has been made manager of manufacturing for the Mallory Metallgurical Co., a division of P. R. Mallory & Co. Inc. Formerly welding superintendent for the division, Mr. Morga is now responsible for all production operations of the division.

• P. C. Osterman, former president, has been elected chairman of the board of directors, J. B. Crabtree, former vice-president, has been made president, and F. C. Schaefer, former sales manager, has been named executive vice-president of American Gas Furnace Co.

• Founders and officers of Research and Control instruments, Inc., include Jason L. Saunderson, president, Paul C. Hutchinson, vice-president and treasurer, Eliot DuBois, vice-president, engineering and manufacturing, Henry J. Levesque, sales manager, and Willard B. Ferguson, controller and assistant treasurer.

• Russell P. Heuer, vice-president of the General Refractories Co., will receive the Francis J. Clamer Medal of the Franklin Institute at the annual Medal Day ceremonies in October. The medal is awarded for meritorious invention and discovery of research achievement in the field of metallurgy. Dr. Heuer's citation reads: "In consideration of his pioneer work in the composition and manufacture of basic brick and in the design of openhearth roof

Technical Papers Invited for ASM TRANSACTIONS

The ASM Transactions Committee is now receiving technical papers for consideration for publication in the Society's Transactions Quarterly for March 1962.

Many of the papers accepted by the Committee will be scheduled for presentation at the 44th National Metal Congress and Exposition; however, publication of a paper does not necessarily infer that it will be presented at the Society's Convention.

Manuscripts in triplicate, plus one set of unmounted original photographs and original tracings should be sent to the attention of John Parina, Secretary, Transactions Committee, American Society for Metals, Metals Park, Ohio. Detailed instructions for preparation of papers for Transactions Quarterly are available on request.

Transactions Quarterly is available to ASM members at an annual subscription rate of $3 (non-member subscription rate $10 per year).

structures which have been major contributing factors in materially increasing the rate of steel production from openhearth furnaces."

• Richard S. Sheetz has been elected executive vice-president of Ohio Crankshaft Co., Cleveland. Mr. Sheetz, 38, had been manager of Westinghouse Electric Corp.'s Springfield, Mass., plant.

• Chester S. Moody has retired from Northwest Engineering Co. to do consulting work.

• A. R. Gaus has been appointed executive vice-president of the Reduction and Refining Co., Inc., a recently acquired subsidiary of P. R. Mallory & Co., Inc. Mr. Gaus joined Mallory in 1952 and has been a staff engineer for Mallory Metallurgical Co. for the past four years.

• Charles W. Brunstetter has been appointed general manager of Ipsen Industries, Inc. He joined the company in 1960 and has been responsible for the development of the Refractory Metals Div., having served as manager of the division.

• Charles P. McShane, formerly customer technical service engineer for the Midwest area, has been appointed manager of technical services, toolsteels, by Crucible Steel Co. of America. He has been with Crucible since 1939.

• Eugene E. Barton, Jr., from Virginia Polytechnic Institute, and Richard L. Heestand, formerly with High Temperature Materials, Inc., have been appointed to the staff of the Oak Ridge National Laboratory.

• William F. Joseph has been named technical director of Rossborough Supply Co. He will be responsible for completing development of several products for the nonferrous foundry industry. He has been plant metallurgist for Precision Castings Co. for the past 18 years.

• William C. Shirley has been appointed staff consultant, Nonferrous Div., Loftus Engineering Corp. He was formerly technical manager for Anaconda Aluminum Co.

• Michael K. Tudor has been named executive vice-president and a director of Micro Metals Corp. He was formerly president of Central Machine Products Corp. and Industrial Research Corp., and is president of Allied Industries, Inc., and Tudor Industries, Inc.

CHAPTER BRIEFS

Although nuclear propulsion for aircraft is no longer a part of the national defense effort, much of the technology developed by the Aircraft Nuclear Propulsion Dept., General Electric Co., is of considerable value to nuclear propulsion projects now active, according to Arthur E. Focke, manager of metallurgy, who spoke at a **San Fernando Valley** meeting.

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The growth and development of new techniques in the science of arc welding were discussed at **Tri-City** by Clarence E. Jackson, Linde Co. The plasma arc, forerunner of arc welding advancement, is proving to be a means of providing the high temperatures required in the cutting, welding or spraying of some rocket age materials. Temperatures up to 60,000°F. are attained by containing an arc within a stream of high current density. The resultant increase of collisions between electrons and molecules provides the desired effect.

• • •

Members of the **St. Louis** Chapter visited the Uranium Division of Mallinckrodt Chemical Works, followed by a dinner meeting and a talk by Arthur E. Focke of General Electric Co., on "Nuclear Power for Aircraft Propulsion".

• • •

Some European steel plants are using a continuous steel casting process to produce a cheap grade of structural steel, according to Neils Engel, professor, School of Chemical Engineering, Georgia Institute of Technology, in a talk at **Atlanta.** All steel compositions, except high-speed toolsteels, have been successfully continuously cast.

• • •

Beryllium is the most promising structural material of the space age, William H. Santschi, manager, research and development, Beryllium Corp., told members of the **Wichita** Chapter. Cost, availability and toxicity are problem areas but have not been major deterrents to advances in beryllium applications.

• • •

Reasons which favor the use of controlled atmosphere heat treating include elimination of expansive after-treatment such as grinding, blasting, etc., and increased mechanical properties, E. J. Pavesic, field metallurgist for Lindberg Steel Treating Co., pointed out at a **Syracuse** meeting.

• • •

Gerald J. Posakony, manager of the Research Division of Automation Industries, gave a comprehensive appraisal of ultrasonic principles at a joint meeting of the **Los Almos** Chapter ASM and SNT. He stressed the fact that despite their high frequency, ultrasonic waves are only mechanical vibrations and obey established scientific laws, and it is therefore possible to describe and predict their behavior in terms of optical and mechanical principles.

ASM CALENDAR OF NATIONAL AND REGIONAL CONGRESSES AND CONFERENCES

Oct. 21-27, 1961—National Metal Congress and Exposition, Cobo Hall, Detroit, Mich.

Feb. 15-17, 1962—Golden Gate Metals Conference, Fairmont Hotel, San Francisco, Calif.

Apr. 14, 1962—Indiana Symposium, Purdue University, Lafayette, Ind.

Apr. 17-19, 1962—Conference and Exhibition: "Materials and Materials Processing for the Petroleum, Petrochemical and Chemical Industries", Shamrock-Hilton Hotel, Houston, Tex.

June 7-9, 1962—Pacific Northwest Metals Conference, Seattle, Wash.

Oct. 29-Nov. 2, 1962—National Metal Congress and Exposition, Hotel Biltmore and Coliseum, New York, N. Y.

President Pennington Charters Three New Chapters

A historic meeting, that opened as the last scheduled meeting of the Carolinas Chapter and closed as the first joint meeting of three new Carolinas Chapters, was held in Asheboro, N.C., on May 18, 1961.

Chairman V. J. Vierling summarized the history of the Chapter and told of the sponsoring of the Savannah, Old South and Columbia Chapters in the past. He predicted that the 180 members involved in the present three-way split would increase to around 300 within a year's time.

W. W. Austin, director of the Carolinas Chapter, presented William A. Pennington, head of metallurgy at the University of Maryland and ASM president, as the featured guest.

Dr. Pennington received the Charter granted in May 1953 from A. R. Fairchild, national trustee and parliamentarian for the Carolinas Chapter. Mr. Fairchild was thus active in both obtaining and returning the Charter.

The chairmen of the three nominating committees then presented their selections of officers and executive committee members of the three new chapters.

Mr. Vierling then called for additional nominations from the floor, and, upon failing to receive any, asked for an oral vote for the candidates proposed.

The proposed slates of officers and directors were unanimously approved by the membership. The officers of the newly chartered chapters are:

Carolinas Northern Piedmont

Chairman	T. E. Gregory
Vice-Chairman	C. L. Saunders
Secretary	O. J. Fischer
Treasurer	C. G. Janis

Carolinas Southern Piedmont

Chairman	J. D. Nesbit
Vice-Chairman	R. N. Hooker
Secretary	J. W. Schout
Treasurer	J. Katz

Carolinas Central

Chairman	P. R. Kosting
Vice-Chairman	C. H. Tuttle
Secretary	L. E. Poteat
Treasurer	F. Weddeling

Dr. Pennington then presented the Charters and bells to the newly formed chapters which were accepted by the officers of each. He also presented a check for $100 to each chapter.

A certificate commemorating his term of office was presented to past chairman of the Carolinas chapter, W. W. Austin, by Dr. Pennington.

Dr. Pennington gave an informal address on the straightforward approach of metallurgical information practiced in the new edition of the ASM Metals Handbook. His talk covered subjects from definitions to economics involved in selection of materials and was generously interspersed with humorous incidents of his experiences.

Bell, Charter and Gavel—the symbols of an ASM chapter are lined up in triplicate awaiting presentation to the three new chapters resulting from a major split of the Carolinas Chapter. In the eight years of its existence, the Carolinas Chapter spawned a total of six new chapters in North and South Carolina and Georgia

Golden Gate Conference Plans Near Completion

Arrangements for the 1962 Golden Gate Metals Conference are virtually completed, according to Wallace J. Erichsen of Westinghouse Electric Corp., Sunnyvale, Calif., Conference chairman. The Conference and exhibits will be held Feb. 15, 16 and 17, 1962, at the Fairmont Hotel in San Francisco.

A total of ten technical sessions have been arranged for the two and one-half day conference by the program committee under the chairmanship of Donald Mash of Advanced Technology Laboratories. Simultaneous sessions will be held.

Wallace J. Erichsen

The program has been built around the general theme "Materials Science and Technology for Advanced Applications". Specific coverage will be given to materials for propulsion systems, space vehicles, missiles and supersonic aircraft. Recognizing the rapidly expanding electronics industry in and around San Francisco, sessions are to be held on materials for direct conversion systems and advanced electronic components. Two sessions will be devoted to new materials and fabrication techniques. An additional session will be devoted to materials and processes to be considered for nuclear power in the space age.

Plans call for the publication of all papers in a paper-bound book which will be available to registrants.

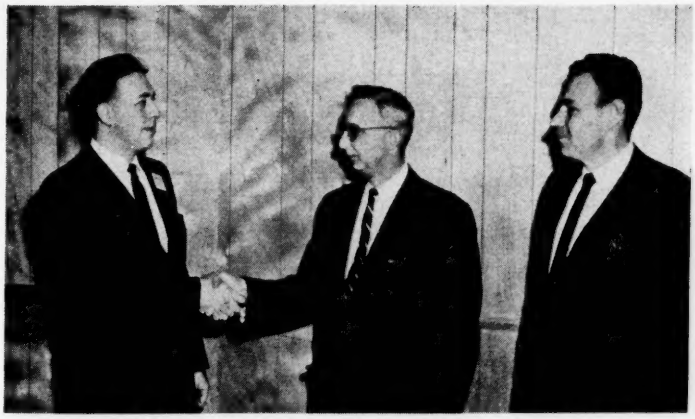
World Metal Show—New York, 1962

For the first time in 28 years, the American Society for Metals will hold its Metal Congress and Exposition in New York City, at the New York Coliseum, Oct. 29-Nov. 2, 1962.

With its location in this gateway city of the world, the headquarters of the United Nations, this 1962 event will be the "World Metal Show and National Metal Congress". ASM will take full advantage of an excellent geographical location to better serve the interests of its members and the metalworking industry.

The New York World Metal Show will be keyed to the demand for expanding American technology, products and services abroad. It will be a dynamic exhibition of American metalworking technology for the entire Free World.

Concurrently with the World Metal Show, the 44th National Metal Congress will be held at New York's Biltmore Hotel. Again, scores of participating and cooperating technical societies promise to make this a "team" achievement in American education. The Congress will be a report to the nation on the major engineering, research and scientific developments in metals, materials and processes during 1962.



Robert J. Christ, technical chairman, education committee, H. R. Clauser, editor, Materials in Design Engineering, and William L. Elliot, member of the education committee, shown at a meeting of the Tri-City Chapter

Selection of Ferrous Materials Based on Design Requirements

How to reduce material cost by proper material selection was explained by H. R. Clauser, editor, *Materials in Design Engineering*, speaking before the **Tri-City** Chapter. Many factors affect the cost of materials, including base price per unit weight, base price per unit volume, cost per unit strength or per unit conductivity, which may also be stated as cost for equivalent use. and price extras such as special finish, straightness, concentricity, chemistry, hardenability, etc., and processing and finishing costs.

Material cost must not be used alone in the selection of material, as over-all cost may be lower by selecting a higher cost material because of its advantage in machinability, corrosion resistance or other finished piece requirements. Also, not to be neglected is the selection of a lower grade material plus some final treatment or finish. Composites or combinations of materials may also be used for the most economical material selection.

Quantity of piece parts plays a very important part in selecting material form and processing. As the number of pieces increases, forming operations which require expensive tooling become more economical. Casting becomes preferable to machining from bar stock, as an example. Also, the selection of casting technique must be investigated. Important considerations include machining and finishing cost, casting tolerances, amount of material required, strength requirements, assembly cost and scrap.

As a general guide, not an absolute rule, Mr. Clauser submitted the following chart as an aid to showing comparative processing costs of metal forms.

COMPARATIVE PROCESSING COSTS OF METAL FORMS

Low Cost	Medium Cost	High Cost
Machining and Finishing		
Screw Machine Parts	Cold Headed Parts	Sand Castings
Metal Powder Parts	Upset Forgings	
Plaster Mold Castings	Press Forgings	
Die Castings	Drop Forgings	
Investment Castings	Permanent Mold Castings	
Electroformed Parts		
Extrusions		
Impact Extrusions		
Stampings		
Spinnings		
Tubing		
Direct Labor		
Metal Powder Parts	Die Castings	Electroformed Parts
Tubing	Permanent Mold Castings	Welded and Brazed Parts
Cold Headed Parts	Stampings	Spinnings
Extrusions	Drop Forgings	Investment Castings
Impact Extrusions	Press Forgings	Sand Castings
	Upset Forgings	Plaster Mold Castings
Tools and Dies		
Extrusions	Permanent Mold	Die Castings
Tubing	Plaster Mold Castings	Drop Forgings
Welded and Brazed Parts	Cold Headed	Press Forgings
Sand Castings	Impact Extrusions	Upset Forgings
Investment Castings	Metal Powder Parts	Stampings
Spinning	Screw Machine Parts	
	Electroformed Parts	

A HIGH LIGHT OF THE EDUCATIONAL *Series on "Testing as Applied to Metals" held by the Rocky Mountain Chapter was a tour of the Titan Missile manufacturing facility at the Martin Co. Other features included talks on Mechanical Property Testing, Physical Property Testing, Corrosion and Nondestructive Testing*

OFFICERS OF THE WORCESTER *Chapter for the 1961-1962 season include, from left: Kenneth H. Lever, Raymond Hagstrom, David Krashes, Laurence T. Maher, all on the executive committee, Chester M. Inman, honorary chairman, Edward F. Grady, executive committee, Gordon T. Rideout, vice-chairman, Francis E. Kennedy, chairman, Paul J. Lisk, executive committee, and Harold J. Cleary, assistant secretary*

EXPLOSIVE FORMING *was defined as a means of shaping metals from the pressure or shock created by the gases of a chemical explosion by Earl K. White, Sr. (right), American Potash and Chemical Corp., at a Tri-City meeting. He is shown at the meeting with John B. Peck and Marvin Pesses*

Hardening of Steel

A better understanding of why steel can be hardened and strengthened by heat treatment is of increasing importance, especially in light of the demand for higher strength-to-weight ratios.

In a talk on "Recent Advances in the Hardening of Steel", Morris Cohen, professor of physical metallurgy at Massachusetts Institute of Technology, and national trustee ASM, told members of the **St. Louis** Chapter that hardening depends on the formation of martensite, hardenability depends on avoiding the formation of bainite and pearlite and hardness depends on the carbon content of the martensite.

An increased understanding of the formation of martensite and the role of carbon in its formation has been achieved by studying iron-nickel-carbon alloys. It is difficult to study martensite formation in plain carbon steel because the Ms changes with carbon content, carbides precipitate to varying degrees during the hardening quench and the amount of retained austenite varies.

By adding nickel the Ms is put below room temperature. It remains constant regardless of carbon content. Using this technique it is possible to cool to various temperatures and precipitate varying amounts of martensite. The properties of the material with various amounts of martensite precipitated can be studied.

Recent advances on the nature of martensite have provided new insight into the mechanism of hardening in the heat treatment of steel. It is now possible to distinguish between the roles of carbon, alloy content and the fine structure of martensite in the strength properties that are attainable by the hardening of steel. In addition, these studies furnish a background for analyzing the recent attempts to obtain ultra-high strength levels in steel by thermomechanical treatments.

During this meeting the Chapter presented MEI Scholarships to one employee from each of six sustaining member companies. This is the third year that these scholarships have been awarded by the Chapter, bringing the total number to 15.

Dr. Cohen presented the scholarship awards to:

Robert J. Burns, Axelson-Garrett Div., U. S. Industries, for "Principles of Machining".

Elbert G. Hacker, Emerson Electric Co., for "Heat Treatment of Steels".

Gerald F. Hoedebeck, Granite City Steel Co., for "Electroplating and Metal Finishing".

George J. Loesch, Laclede Gas Co., for "Heat Treatment of Steels".

Donald J. McCollom, Jos. T. Ryerson & Sons, Inc., for "Fundamentals of Ferrous Metallurgy".

W. E. Ulery, McDonnell Aircraft Corp., for "Elements of Metallurgy".

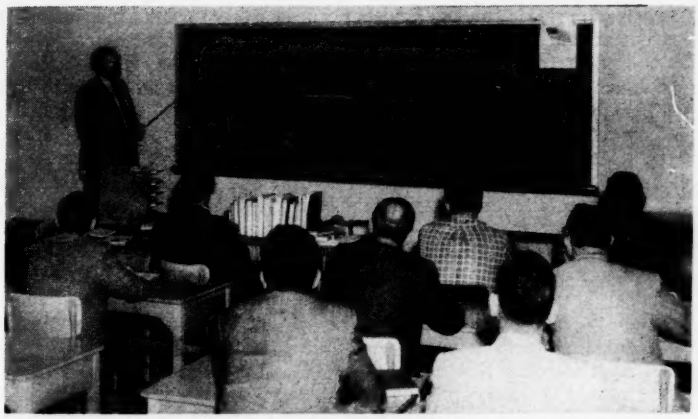
—(*Reported by David E. Murray*)

Synthetic Diamonds

The earliest attempts at diamond synthesis were unsuccessful because of the lack of sufficient pressure so that the reaction could take place under conditions where diamond is the stable form of carbon. R. W. Guard, manager, diamond process engineering Metallurgical Products Dept., General Electric Co., who addressed the **San Fernando Valley** Chapter on the subject, "Man-Made Diamonds", stated that Bridgeman and other workers showed that direct transformation by pressure alone was not likely below 600,000 bars (1 bar = 14 psi.) Subsequent experiments on the conversion of diamond to graphite showed that the activation energy of the diamond reaction was very high. The problem then was to devise an apparatus capable of maintaining diamond stable conditions at high temperatures and to find a stable catalyst system for the reaction.

The final equipment designed for generating the pressures necessary was the work of H. Tracy Hall in the G.E. research laboratory (Dr. Hall is now at Brigham Young University). This device, known as the "belt", relies on the massive support of a carbide chamber and the use of side-loaded punches to attain the necessary pressures greater than 40,000 bars.

In this apparatus many possible chemical systems were studied. In the successful system a metallic catalyst is used to accomplish the conversion of carbon or graphite to diamond. Metals such as iron, nickel, cobalt, platinum and palladium have been found to be effective catalysts. As in all similar processes involving nucleation and



THE WILMINGTON CHAPTER SPONSORED *a short course on "Introductory Metallurgy" for the benefit of those working in the field who have not had formal training. Leon A. Monson, research metallurgist, DuPont Co., shown hard at work, had a class of over 40 men*

DESIGNING FOR WELDING *was the subject discussed by Omer W. Blodgett at a joint meeting of the Tulsa Chapters ASM, ASME and AWS. Mr. Blodgett pointed out methods for improving structures through the efficient use of welded steel design. Shown, from left: L. Z. Johnson, chairman AWS, Jack Garol, chairman ASM, Mr. Blodgett, and Robert A. Best, chairman ASME*

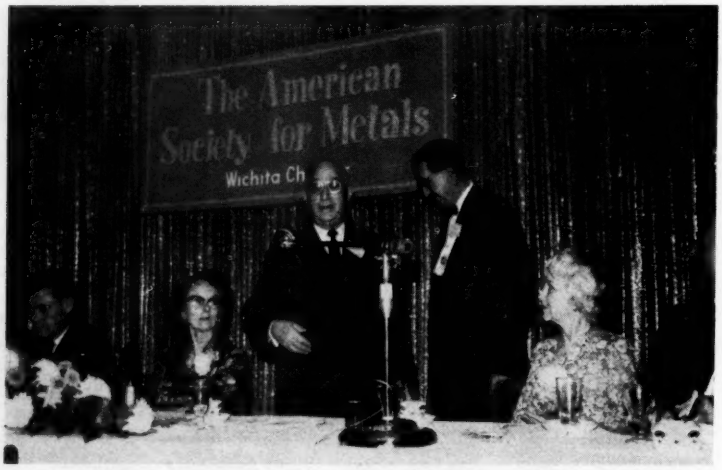
LEHIGH VALLEY CHAPTER *entertained over 100 high-school students and guidance counselors from more than 20 area schools at its annual Students Night Meeting. Peter King, associate director of research for materials, U. S. Naval Research Laboratory, spoke on "Materials Research for Your Generation". Pictured are: Neil J. Culp, Student Night Committee chairman; Michael Repko and Eugene Sovecka, students from Whitehall Township High School; Dr. King; J. Byron Godshall, chairman; and Thomas Davies, guidance director for Whitehall High School*

growth of crystals the size and perfection of the crystals are affected by the nucleation and growth rates which are functions of pressure and temperature and the chemical environment.

At present there are three kinds of industrial diamonds produced—two commercially and one in laboratory quantities. For use in resin and vitreous-bonded grinding wheels a fairly friable rough-surfaced crystal is desired. A crystal of this type, known as RVG, has performed successfully in many such applications. Not all applications benefit from crystal friability. Tougher but still rough-surfaced crystals can also be produced. This type, known as MGB, is used in metal-bonded grinding wheels. In these two crystal types, by controlling the growth conditions, crystal toughness is matched to the wear rate of the matrix of the grinding wheel in which they are held. There is available in the laboratory an even tougher crystal for concrete and masonry saws.

In addition to research to find processes for making larger, more perfect crystals, programs are under way toward expanding the use of diamond as an abrasive. Initial studies have shown that difficult-to-grind steels can often be ground more economically with diamond grinding wheels. Another area where diamond shows some promise is in the grinding of plate glass.

The future holds other interesting features as a result of the added dimensions of high pressure to the available chemical technology. High-pressure reactions have been carried out to form a hard structure of boron nitride known as Borazon. As we learn more about this material, which has many of the characteristics of diamond, it may well find uses in which its properties are unique. As we continue to explore more areas of chemical reactions and transformations we can expect new materials to appear. It is much too early to predict any of the uses these new materials may have. *(Reported by E. F. Green)*



H. H. Minard, member of the Board of Directors, Wichita City Library, accepts the annual grant of $100 from past chairman Bob Layton, chairman of the long-range planning committee at a recent meeting. From left are: Lt. Gov. Harold Chase, Mrs. E. E. Sattgast, Mr. Minard, Bob Layton, Mrs. and Dr. William Pennington

Wichita Library Grant

After the first educational program presented in 1954 by the **Wichita** Chapter, consideration was given to how the funds from successful educational programs would be used. It was agreed by the executive committee that action would be withheld until such time as a fund could be created which would be essentially self sustaining. In 1961 this fund was formally established when, upon action of the executive committee, $1500 from the Chapter fund was placed in a savings account to draw interest at the rate of 3% per year. Chairman Page appointed a long-range planning committee to delve into the possibilities for use of the returns from this investment. This committee was made up of R. E. Layton, chairman, R. E. Samuelson and John Fultz.

After due consideration, the committee recommended that the Wichita City Library be made the recipient of an annual grant of $100, with certain restrictions, for the purpose of improving the quality of the books and/or periodicals available at the Library. The recommendation was unanimously adopted by the executive committee at the February 1961 meeting. At the same time a committee was appointed to select the books to be purchased by the Library.

The formal presentation of the grant was made to Ford Rockwell, city librarian, at the Library on Mar. 21, 1961. Formal announcement was made to the members of the Chapter at the National Officers and Past Chairman's Meeting on Mar. 29.

The Wichita Chapter has sustained an ASM membership for the Wichita City Library for many years.

MEI Courses Completed

At a recent graduation dinner 36 men from the Haynes Stellite Co., Kokomo, Ind., were awarded MEI certificates. Twelve men completed the "Foundry Practice" course and 24 men completed the "High-Temperature Metals" course.

Fred Kroft, works manager, commended instructors Warren Ballantine and Pete Lansing and the graduates. . . . "It is gratifying to see that there are men who want to better themselves on their time and partially at their own expense. The company recognizes the extra effort you have expended, indicating your keen interest in the company and in your work".

Rockford Honors Students

The National Officer's Night meeting of the **Rockford** Chapter is fast becoming an annual three-in-one affair. First, it serves as an opportunity to hear one of ASM's national officers speak: this year Carl Swartz, national vice-president and president-elect, was the guest of honor. Second, it provides an opportunity to recognize those people (mostly nonmembers) who have completed the Chapter's annual seminar course. The diplomas this year were awarded for successful completion of an eight-week series on "Machining of Metals". Finally, at this meeting, local high-school science students are given an

opportunity to exhibit their science project work.

Dr. Swartz, in addition to his talk on "The Uncommon Man", served as one of the three judges charged with determining the first-place winner of the Student Science Project Competition for 1961. This project was conceived by the Chapter in 1958 and has been held annually since. Planning and liaison between the Chapter and schools is handled by the Chapter's student affair committee. The program is intended to be in direct support of the Science Achievement Award for students conducted by the Future Scientists of American Foundation of the National Science Teachers Association. In line with objectives of that program, the Chapter does not restrict the scientific field of interest of the projects. Thus, projects based on natural or physical sciences are welcomed, whether they concern metals or metallurgy or not. The students' work, while primarily an extracurricular activity, is carried out under the direction of the head of each high school's science club. The ASM Chapter attempts to make its members and friends available for counsel, as well as extending aid in materials procurement and processing from local industry where needed.

At the meeting, each student exhibitor receives a certificate of participation and, upon presentation of a write-up of his project, also receives a $10 award, which is intended to help defray his costs in completion of his project. Judging of the competition is performed by local college or professional people and a first prize is awarded on the basis of originality, ingenuity, difficulty, presentation and knowledge of the subject. The winner is awarded a plaque bearing the ASM crest, identification of the event and his name. The plaque is turned over to the winner's school for permanent display.

The timing of the event enables the student to experience critical review of his work prior to participation in Illinois District and State Junior Academy of Science competition which takes place a month after the ASM meeting. Thus, the Chapter attempts not only to encourage and recognize high-school science talent, but also to offer constructive comment designed to aid the student exhibitor in later competition.

The judges this year should be complimented since the Chapter's first-place winner won a prize in botany at the Academy District finals in DeKalb, Ill. Second choice by a whisker at our competition also won a first prize in the District meet in the physics category for his nuclear radiation detector.

Some of the titles of projects entered in the last two years in the Chapter's competition are: liquid fueled rocket, elementary particle characteristics, bessemer converter, steam engine with solar energy drive, sunspots and their effect on communications, electromechanical computor, electronic truth analyzer, induced mutation of bacteria and solid state nuclear radiation detector.

Winners of the 1961 competition were Alan M. Drulis and Douglas L. Nelson of Rockford East High School for their project on "Culturing Antibiotic Organisms". *(Reported by Wilson Leeming)*

G. M. GILMOUR, MANAGER *in the industrial publications division, MacLean-Hunter Industrial Newspapers Division, who spoke on "The Canadian Metalworking Industry as Seen by a Publisher" at a meeting in Montreal during which numerous awards were presented, including a Life Membership Certificate to R. Thompson, the Chapter Scholarship to Jacques Cote of Ecole Polytechnique, the Gordon Sproule Memorial Scholarship to R. W. Amos of McGill University, the ASM Foundation Scholarship to R. D. Saunders of McGill and to J. P. Borduas of Ecole Polytechnique*

New Books

Nuclear Reactor Containment Buildings and Pressure Vessels. Royal College of Science and Technology, Symposium, May 17-20, 1960. Butterworths Inc., 7235 Wisconsin Ave., Washington 14, D.C. $18.50.

Powder Metallurgy in Nuclear Engineering. Bibliography 1956-1960. H. H. Hausner and Helen Friedemen. Metallwerk Plansee Artiengesellschaft, Reutte/Tyrol, Austria.

Progress in Very High Pressure Research. John Wiley and Sons, 440 Park Ave., New York 16, N. Y. $12.

Reactor Handbook, 2nd Edition. Vol. 2—Fuel Reprocessing. S. M. Stoller and R. B. Richards, Editors. Interscience Publishers, 250 Fifth Ave., New York 1, N. Y. $21.40.

Response of Metals to High Velocity Deformation. Vol. 9. Metallurgical Society Conferences. P. G. Shewmon and V. F. Zackay, Editors. Interscience Publishers, 250 Fifth Ave., New York 1, N. Y. $18.

Soviet Electrochemistry (Translation from the Russian.) Vol. 2, 3, 4. Consultants Bureau, 227 W. 17th St., New York 11, N. Y. $15 each, $40 set.

Structure and Properties of Thin Films. Neugebauer, Newkirk and Vermilyea, Editors. John Wiley and Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $15.

RALPH N. S. MERRITT, JR., *secretary-treasurer, Kenneth H. Lever, technical chairman, Walter G. Dahlstrom, chief research engineer, American Steel & Wire Div., U. S. Steel Corp., who spoke on "Use of Metals and Metallic Oxides in Electric Wires and Cables", Arthur L. Stowe, junior past chairman, Laurence T. Maher, executive committee, and Paul J. Lisk, assistant secretary, are shown at a meeting of Worcester Chapter*

Gas Turbine Materials

The combustion gas turbine is a complete power plant for the internal combustion of fuel to drive rotors, etc. Its operational sequence involves the introduction of compressed air into the fuel combustion chamber where the gases expand to rotate the turbines. Exhaust gases are recovered to perpetuate the sequence or to provide thrust for motivation.

M. C. Metzger, metallurgical engineer, technical service, Universal-Cyclops Steel Corp., who spoke on "Materials for Gas Turbine Applications" at **Peoria,** then pointed out that gas turbine engines are used in the electrical field, processing, oil and gas pumping, steel blast furnace and auxiliary power industries, as well as in the railroad, marine and automotive industries, and in military and commercial aircraft and jet engine starters. Nuclear powered turbines may be found in the future on ships, locomotives and airplanes. Gas turbines are well established in some fields and a relative newcomer in others, but their future appears to hold great promise in most areas of application.

Materials for gas turbine usage must be capable of high strengths at elevated temperatures. Turbine wheels of turbojet engines on aircraft are currently operating at 1200-1500° F. and 2000° F. temperatures are anticipated on models now in the design stage. In general, the basic requirements of gas turbine alloys revolve around their inherent properties, such as thermal expansion, modulus of elasticity, corrosion resistance, etc., their developed properties, such as tensile, yield, fatigue, impact strength, etc., and their availability, machinability, weldability, cost, etc.

The superalloys, as gas turbine materials have come to be known, are classified into iron, nickel and cobalt-base categories. These classifications are further subdivided by structure (martensitic or austenitic), response to heat treatment and alloy content.

Many problems confront the design engineer and metallurgist in dealing with these alloys. Prominent among these are thermal shock failures, fatigue failures, creep damage and fuel damage. Consideration was given to approaches to these problems.

Vacuum induction melting appears to hold great promise in the effort to acquire the degree of purity needed in the achievement of the properties necessary for the requirements of gas turbine materials. Vacuum melting offers substantial advances over conventional air melting processes including lower gas content (oxygen, hydrogen and nitrogen), a higher degree of metal cleanliness, improved ingot soundness and workability and general improvement in mechanical properties. *(Reported by W. M. Hallett)*

Materials Research Conference

A Materials Research Conference will be held at Rensselaer Polytechnic Institute on Dec. 18-19, 1961. Joint sponsors with the Institute are the Watervliet Arsenal with cooperation of the Advanced Research Projects Agency, the U.S. Atomic Energy Commission, the National Aeronautics and Space Administration and the U.S. Army.

Papers on important contributions in materials research and involving recent work not reported elsewhere are desired. Entire papers, or abstracts of not less than 500 words, should be sent to Dr. M. J. Hordon, Watervliet Arsenal, Watervliet, N.Y. Notification of acceptance will be made by Oct. 23.

Robert Weigle, Watervliet Arsenal, is conference chairman.

THE SOCIAL HOUR DURING A NEW JERSEY *meeting shows ASM National Treasurer R. J. Raudebaugh, H. F. J. Skarbek, chairman, John C. Lewis, member, William C. Schulte, 1952-53 chairman, and John P. Nielsen, professor of metal science, New York University, who presented a talk entitled "Metallurgy in the Communist States"*

EMPLOYMENT SERVICE BUREAU

Operated on a no-charge basis for A.S.M. members in good standing. Ads are limited to 50 words and only one insertion of any one ad. Address answers to: Box No., American Society for Metals, Metals Park, Ohio, unless otherwise stated.

POSITIONS OPEN

SALES METALLURGIST: Prefer graduate with laboratory experience, on polishing equipment and microscopes, hardness testers, etc. Established office and territory, Boston area. Excellent future. Box 10-5.

MECHANICAL ENGINEER: Work with new forging installation in Northwestern Pennsylvania. Five years minimum experience in design of heavy machinery, preferably water hydraulic forging or extrusion presses. Machine shop experience desirable. Mechanical engineering degree not necessary but desirable. Salary commensurate with experience. Send resume in confidence to: Personnel Director, National Forge Co., Irvine, Pa.

SALES: Good opportunity for experienced electrical resistance alloy wire salesman in the metropolitan New York area. Opportunity is with leading American owned manufacturer of electrical resistance materials plus other heat and corrosion resisting alloy wire. Salary and generous bonus arrangement with outstanding opportunities in company growth. Box 10-105.

PHYSICAL METALLURGIST: B.S. degree in Metallurgy with 2-5 years experience to work in an engineering department of automotive company, working on ferrous and nonferrous alloys in developing materials, material specifications, part failure analysis, metallography and heat treatment. Salary open. Write to: A. H. Rodenbeck, International Harvester Co., Motor Truck Eng. Dept., Ft. Wayne, Ind.

CASTING-FOUNDRY PROCESS ENGINEER OR METALLURGIST: In expanding our nonferrous foundry operations into new fields we need an experienced man with about 5 to 10 years working background in small castings. The work will involve establishment of complete production operations, including pilot plant start, and continued direction and expansion of our foundry activities in nickel and cobalt-base metals. Please send resume, salary expectations in confidence: Box 10-10.

PRODUCT DEVELOPMENT ENGINEER: Internationally known metallurgical company offers young man opportunity to assume responsibility for project efforts in powder metallurgy of refractory materials, from powder technology through fabrication techniques. One to three years experience and B. S. degree in metallurgy desired. Company-sponsored graduate program with Purdue University. Box 10-15.

GROUP LEADER-METALLURGICAL DEVELOPMENT: Aerospace-oriented metallurgical R & D section is seeking a supervisor for a group engaged in: 1) advanced programs to further the fundamental understanding of the physical metallurgy of nickel, cobalt, iron and refractory-base alloys, and 2) basic programs in the fabrication of refractory metals and high-strength, high-temperature alloys. Ability to furnish technical leadership is of prime importance. Qualified individuals should have supervisory experience plus strong educational background. Send resume: Box 10-80.

SALES: Nationally known producer of high-nickel alloys in wire, rod and strip has sales opportunities in Chicago, Detroit and Ohio territories. Please send a resume giving complete experience and education along with current earnings. Reply to Box 10-110.

RESEARCH METALLURGIST: Opening in leading steel castings laboratory for work on shaped castings and semifinished mill shapes. Challenging work in the field of welding wire development in high-strength steels, new molding and pouring methods. B.S. or M.S. in metallurgical engineering, chemical engineering or ceramics. Box 10-90.

METALLURGIST-RESEARCH AND DEVELOPMENT: Must be fully experienced with good background in common and refractory metals, for a unique process using high-frequency induction principles. Responsible position with good future with progressive company. Start ground floor. Please send resume and salary expected. Box 10-20.

METALLURGICAL ENGINEER: With managerial ability and experience with copper and copper alloys to head manufacturing operation of aggressive new company. Send resume, including salary requirements to: Box 10-95.

POSITIONS WANTED

PLANT SUPERINTENDENT: Five years plant superintendent vacuum induction melted superalloy, 12 years chief metallurgist in aluminum, magnesium and iron foundry. Extensive experience in all phases of foundry and casting industry. Considerable experience in technical phase of customer relations. College graduate, publications, age 45. Resume on request, available immediately. Box 10-25.

METALLURGICAL ENGINEER: B.S. degree, age 39, family. Two years steel manufacturing wire, sheet and bar processing, two years research and development in aircraft plant, experience in aluminum, stainless steel, titanium and high-strength steel. Three and one-half years experience in process development, also laboratory supervision. Desires position as field engineer in Southeast. Resume on request. Box 10-30.

METALLURGICAL ENGINEER: M.S. degree, early thirties, married, children. Registered professional engineer. Experience in development, evaluation, application of refractory alloys, coatings. Analytical and experimental aptitudes. Superior writing ability. Capable of generating original ideas. Broad range of interests. Desires to combine serious research with opportunity to work towards doctorate. Resume on request. Box 10-35.

TECHNICAL WRITER: Ten years experience writing company-wide purchase specifications and test methods for metallic materials. One and one-half years experience writing Navy personnel instruction books on control mechanisms for gun directors. Four and one-half years experience in documentation (abstracting, indexing, classification, searching operations, compilation of bibliographies for meeting specialized information requirements). Box 10-40.

METALLURGIST: M.S. degree, thoroughly experienced in ferrous metals, from high-alloy steels to iron, induction melting, heat treating, corrosion, wear and casting. Ten years applied research and development in close cooperation with sales, production and quality control departments. Desires challenging position with opportunity for advancement. Box 10-45.

METALLURGICAL ENGINEER: B.S. degree, age 32, married. Eight years experience in application of materials for high-temperature and corrosion resistant components; fabrication and process development; field trouble shooting and technical counseling; author of published articles. Desires responsible position in customer contact work or sales engineering, Midwest, Southwest, West Coast. Box 10-50.

METALLURGICAL ENGINEER: B.S. degree. Desires responsible position requiring initiative coupled with usage of education and experience. Five years in materials and processes, research and development, in ferrous, super and refractory alloys. Two years purchasing and contract negotiation. Age 29, married. All locations considered. Present salary $9000. Box 10-55.

TRAINEE ENGINEER: Filipino, 1959 graduate of the Mapua Institute of Technology, with B.S. in mechanical engineering, desires to come to United States as an engineering trainee. Presently employed as supervisor of weaving department at manufacturing company. Age 25, single. Box 10-60.

ADMINISTRATIVE-SUPERVISORY: Physical chemist-metallurgist. Ph.D. degree, age 31. Six years experience in research and development. Physical and extractive metallurgy of the defense metals. Physical chemistry of fused salts. Sales technical service. Seeks position leading to responsibilities in research administration, technical liaison, or marketing. Prefers East. Resume on request. Box 10-65.

PHYSICAL METALLURGIST: Ph.D. in materials science, M.S. in physical metallurgy. Presently employed in research laboratory. Would like opportunity to do basic research in the U.S. or abroad. Box 10-70.

MANUFACTURING ENGINEER: Extensive and broad plant management and sales experience in the manufacture of aircraft engines, automotive parts and mechanical products. Broad experience in aircraft, nuclear and missile components, development of manufacturing methods, plant management, personnel and labor relations. M.E. degree. Box 10-75.

CHIEF WELDING ENGINEER: Engineering degree, age 38, single. Just completed one year study as full-time student in welding engineering at Ohio State University. Ten years production, design and R & D experience in alloy and exotic materials joining. Welding consultant for large fabricator (1000 operators). Instructor, lecturer, publications and technical committee member for ASME Code, shipbuilding, AEC, powerhouse and refinery welding. Nondestructive testing. Ferrous and nonferrous, all processes. Can organize and administer your complete welding design and fabrication program. Box 10-100.

PHYSICAL METALLURGIST: Age 36. Eight years experience in research of high-alloy specialty irons and steels. Development of fabrication techniques for nonferrous and refractory alloys. Desires position where individual achievements are recognized. Box 10-85.

MATERIALS AND PROCESSES MANAGER: Age 34, B.S. degree, advanced study in corrosion and nondestructive testing, nuclear and aircraft experience, high-temperature materials, stainless and toolsteels, uranium metallurgy, corrosion, nondestructive testing, process development and specification writing, publications. Presently in management as metallurgist-chemist. Box 10-130.

METALLURGICAL ENGINEER: M.S. degree, 12 years diversified research and development experience. Extensive background in nonferrous alloy development, particularly for creep, conductivity, precipitation hardening and alloy transformation. Familiar with all stages of tube production. Experience embraces powder metallurgy, refractory alloy studies and coatings. Patents. Seeks new challenging administrative or technical position. Box 10-135.

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Blast Furnace Operations
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Stainless Steels
Electroplating and Metal Finishing
Gray Iron Foundry Practice
Oxy-Acetylene Welding
Steel Foundry Practice
Recovery of Lead and Zinc
Steel Plant Processes
Ferrous Metallurgy
Corrosion
Principles of Machining
Principles of Heat Treating

Please send me complete information and costs on courses offered by MEI.

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Perform original research on forming, drawing and related secondary fabrication methods for aluminum and copper based alloys at our new Metallurgical Laboratories at New Haven, Connecticut. Research will entail both experimental and theoretical analysis of problems in plasticity.

Fundamental contributions to the literature in this field will be encouraged.

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SENIOR RESEARCH SCIENTISTS

Outstanding opportunities for scientists with Physical Metallurgy or Ceramics background interested in basic materials research. Responsible positions available for Ph.D's preferably with post-doctorate research experience.

Current group interests are in mechanical properties of crystalline and non-crystalline solids, including single and polycrystalline ceramics, refractory metals and plastics; oxidation mechanisms in metals; alloys for high temperature thermocouple purposes. *Write in confidence to: Dr. C. H. Li, Honeywell Research Center, Hopkins, Minn.*

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One of the largest West Coast producers of investment and precision castings offers this challenging opportunity to a man with imagination and drive, plus the ability to get things done.

This position, reporting to the President, has complete responsibility and authority for all production activities.

Excellent salary and benefits, plus growth potential. Applicant must have engineering or metallurgical degree, plus a minimum of three to five years experience as Superintendent, Production Manager, or Manufacturing Manager at a metalworking plant. Experience in investment casting desirable but not required.

Send resume in confidence to Box 10-115, Metals Review.

Metallurgist, with mechanical and chemical interests, under 30, to conduct a technical program in a quality product firm, established 50 years, engaged in precious metal fabrication. Good advancement opportunities with ample evening educational facilities available in the area. Starting salary $750. New York City. Write Box 10-125.

PHYSICAL METALLURGY

M. S. or Ph. D. preferred. 10 or more years experience in research and development on stainless, high temperature, super alloy or tool steels. Position of considerable responsibility with prominent alloy steel producer. To $20,000.

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A long established manufacturer of drop forgings desires a graduate metallurgist, preferably with three to five years aircraft forging experience primarily on ferrous metals. Reply stating age, education, background, experience, and salary required.

The Billings & Spencer Company

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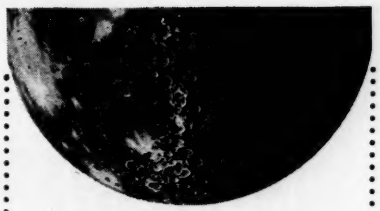
Attn: Vice President



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PHYSICAL METALLURGY

A Physical Metallurgist with experience in oxidation and corrosion of metals. Experience in refractory metals and alkali metals is also desirable. An advanced degree in Physical Metallurgy is required.

REFRACTORY COATINGS

Will perform research into protective coatings for heat, oxidation and erosion resistance. This work is concerned with all phases of refractory coatings technology varying from studies of the materials involved to application and evaluation techniques. An advanced degree in Chemistry, Ceramics or Metallurgy is required.

The work at Rocketdyne involves research on the materials and processes used in present and future space propulsion systems. We are active in all aspects of space propulsion including liquid and solid propulsion engines, plasma, ion and nuclear engines, as well as hybrids.

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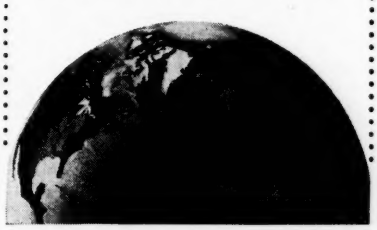


the 3 minute glass

Several years ago Walter Crafts, then vice-president of ASM, Ted Du Mond, Director and Member Chapter Relations, and Evelyn Gardner, secretary to the ASM Board of Trustees, met with ASM chapter officers in a series of regional meetings throughout the country. The meetings proved mutually helpful to the chapter people attending and to the representatives of the National organization.

In the intervening years we frequently have been asked if such meetings could not again be held. I am now delighted to be able to answer an enthusiastic "Yes!"

My enthusiasm stems from a strong awareness that of all modern means of communications there is no adequate substitute for person-to-person contact. I wish that I personally were able to attend all of the 25 regional officers' meetings and four meetings with individual chapters being scheduled for the current chapter year. Unfortunately this is not possible.

The meetings will be conducted by Ted Du Mond who will bring to them an intimate and extensive acquaintanceship with most chapter problems and their solutions. Whenever possible, Ted will be accompanied by a member of the Board of Trustees or a member of the ASM Chapter Advisory Committee — or both.

Meetings of this nature serve three major purposes. First they present the opportunity for first-hand discussion of ASM's national policies and objectives. Second, chapter representatives have the opportunity of seeking advice on their local problems, expressing their attitudes on Society affairs and contributing their suggestions for the betterment of ASM. Third, opportunity is provided to exchange viewpoints and experiences with counterparts in other chapters in the area.

The least to be expected from the meetings is a closer liaison between chapters and the National officers and staff of ASM. With such a liaison it becomes much easier to work in unison to achieve the common goals of constantly improving ASM services to its members, to the industries they serve and the communities in which they reside.

Dates, locations and chapters for each meeting have been established according to the following schedule:

Nov. 1—Chicago (Chicago, Chicago-Western, Milwaukee, Peoria, Calumet, Rockford)

Nov. 7—Pittsburgh (Pittsburgh, Upper Ohio Valley, Beaver Valley, Penn State)

Nov. 10—Dayton (Dayton, Cincinnati, Columbus, Southeast Ohio, Louisville)

Nov. 16—New York (New York, Long Island, New Jersey, Lehigh Valley, Northeast Pennsylvania)

Nov. 21—Metals Park (Cleveland, Warren, Akron, Canton-Massillon, Mahoning Valley)

Nov. 28—Detroit — (Detroit, Western Ontario, Jackson, Central Ontario, Saginaw Valley, Western Michigan, Toledo)

Nov. 30—Fort Wayne — (Fort Wayne, Notre Dame, Purdue, Muncie, Indianapolis, Terre Haute)

Dec. 5—Des Moines (Des Moines, Cedar Rapids, Tri-City, Minnesota)

Dec. 7—Wichita (Wichita, Kansas City, Tulsa, Oklahoma City)

Dec. 8—St. Louis (St. Louis, Sangamon Valley, Missouri School of Mining & Metallurgy)

Dec. 12—Ottawa (Ottawa Valley, Quebec, Ontario, Montreal)

Dec. 13—Springfield, Mass. (Springfield, Boston, New Haven, Hartford, Worcester, Rhode Island, New Hampshire, Eastern New York)

Dec. 14—Rochester, N.Y. (Rochester, Buffalo, Syracuse, Southern Tier, Northwestern Pennsylvania, Mohawk Valley)

Jan. 10—Baltimore (Baltimore, Philadelphia, York, Delaware Valley, Washington, Wilmington, Richmond)

Jan. 12—Winston-Salem (Carolinas Central, Carolinas Piedmont North, Carolinas Piedmont South, Virginia Polytechnic Institute, Columbia)

Jan. 22—Orlando, Fla. (Orlando, Jacksonville, West Central Florida, Miami)

Jan. 24—Atlanta (Atlanta, Chattanooga, Old South, Savannah River, Birmingham, Oak Ridge)

Feb. 12—Phoenix

Feb. 13—Los Angeles (Los Angeles, San Fernando Valley, San Diego)

Feb. 14—San Francisco (Golden Gate, Santa Clara Valley, Sacramento Valley)

Apr. 11—Salt Lake City (Utah, Bonneville)

Apr. 13—Denver (Rocky Mountain, Pueblo)

Apr. 20—Houston (Texas, North Texas, New Orleans)

Apr. ?—Seattle (Puget Sound, Oregon, Inland Empire, British Columbia, Columbia Basin, Vancouver Island)

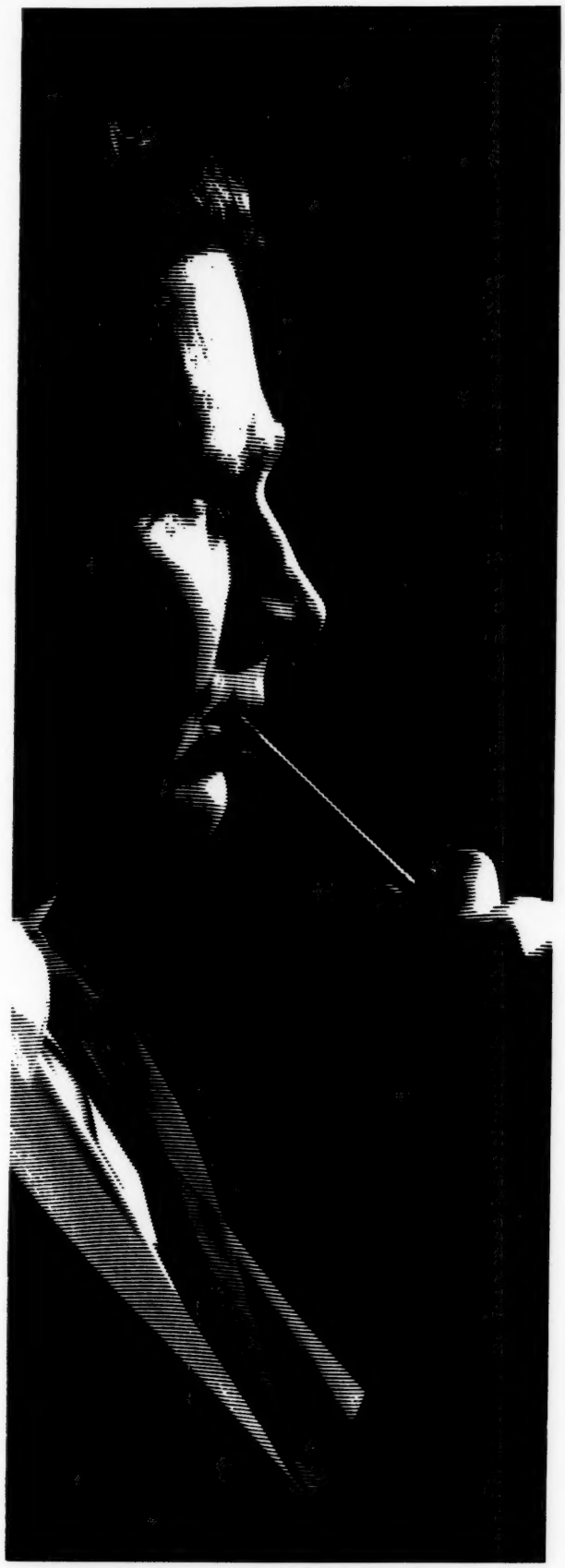
May 9—Houghton, Mich. (Michigan College M & T)

May 10—Sault Ste. Marie (Northern Ontario)

May 11—Winnipeg (Manitoba)

May 12—Medicine Hat, Alta. (Alberta, Edmonton, Medicine Hat)

Allan Ray Putnam
Managing Director



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To work with thermo-electric materials. Must be thoroughly competent solid state physicist, but you do not necessarily need previous thermo-electric experience.

PHYSICAL ELECTRONICS & PLASMA PHYSICISTS

To work on thermionic energy conversion and/or magnetohydrodynamic energy conversion.

METALLURGISTS

Must have Ph.D. or M.S. degree or full equivalent experience. To work on thermo-electric and high temperature materials, including ceramics and refractory metals.

PHYSICISTS & ELECTRICAL ENG.

For experimental research in solid state or physical electronics.

DEVELOPMENT

ENGINEERS (E.E. OR M.E.) PHYSICISTS & CHEMISTS

To work on prototypes of thermionic and thermo-electric energy conversion devices. Technical disciplines sought include knowledge of heat transfer, use of isotopes and reactors as heat sources, ability to check a design or model, knowledge of materials (including refractory metals, high temperature ceramics and thermo-electric compounds), metals compatability and stress analysis.

MODEL SHOP SUPERVISOR

To head up projects for building prototypes of thermionic and thermo-electric conversion devices. Will be advisor on manufacturing. Need manufacturing experience and knowledge of materials. Degree desirable.

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NUCLEAR DIVISION

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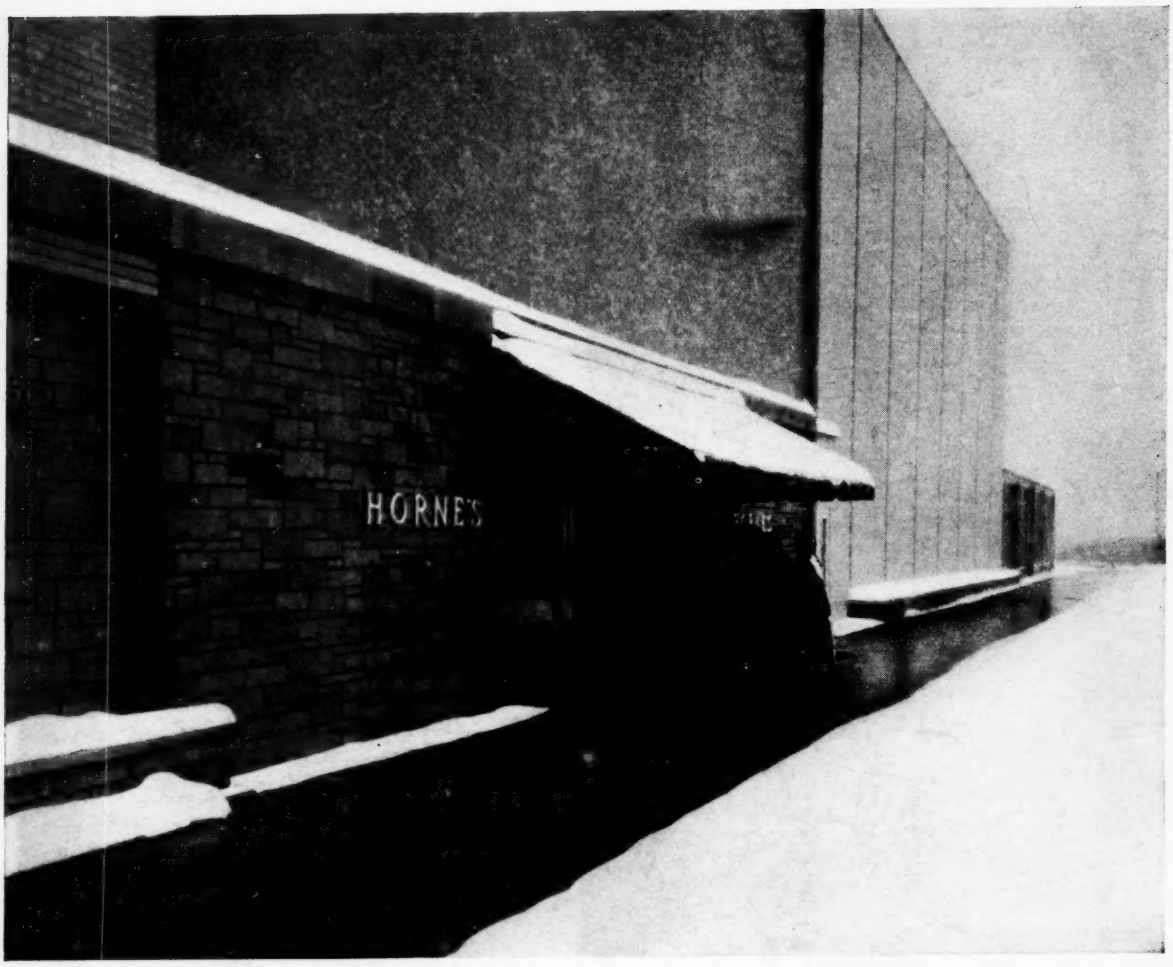

This sidewalk is wired for snow

Nickel alloy electric heating cables in the concrete melt snow as fast as it falls!

No shoveling, no salting, no customer accidents on slippery sidewalks at *this* suburban branch of a Pittsburgh department store. Electric heating cables keep the sidewalks clear of snow and ice during even the worst winter weather.

Saves maintenance costs. In addition to taking the bother out of blizzards, the system eliminates the cost of conventional sidewalk clearance. And further savings are realized because the heating cables—made of 80% Nickel—require no maintenance.

High Nickel alloy cables were used because of Nickel's superior resistance to corrosion, fatigue and extreme temperatures. These Nickel alloy cables will withstand years of repeated heating and cooling, and seasonal expansion and contraction of the concrete.

Just one example of Nickel's versatility. Electric heating cables—also used to melt snow and ice from roofs and driveways—is another example of how Nickel helps make possible new products and processes, and improves existing ones. In most any application, Nickel's wide range of important properties . . . corrosion resistance, strength, long life and beauty, to name just a few . . . offers proven advantages.

If your business is metals, or if you use metals in your business, call on Inco for the latest information about how Nickel and its alloys can help you.

Imbedded near the concrete surface, electric heating cables of 80% Nickel keep the sidewalks clear of snow and ice. Cables made by Edwin L. Wiegand Company, Pittsburgh.

THE INTERNATIONAL NICKEL COMPANY, INC.
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INCO NICKEL

NICKEL MAKES ALLOYS PERFORM BETTER LONGER